University of Stuttgart
Collaborative Research Center 1667 ATLAS

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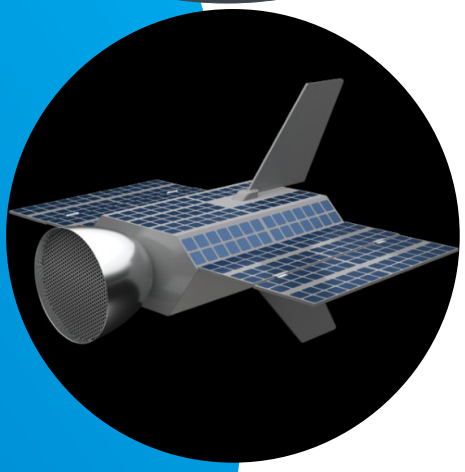
Optimization of Ground Station Networks for Reliable Communication with VLEO Satellites

Bachelor / Master Thesis

Opportunity

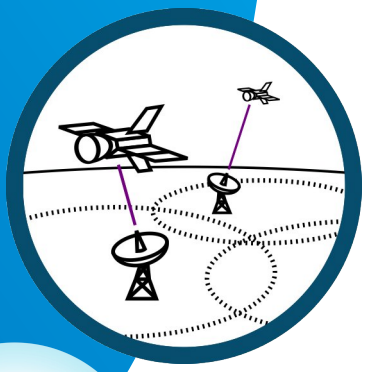
The collaborative research center (CRC) "Advancing Technologies of Very Low Altitude Satellites (ATLAS)" at the University of Stuttgart, funded by the German Research Foundation (DFG), addresses the fundamental scientific and engineering challenges of rendering Very Low Earth Orbit (VLEO) accessible and extending satellite lifetime by an order of magnitude. As part of this research project, the fundamentals of VLEO satellite operations are being investigated by drawing on expertise gained from operating satellites at the University of Stuttgart.

The aim of this thesis is to identify the optimal ground station placement for VLEO satellite missions in different orbital configurations to optimize their communication windows. Compared to conventional LEO missions, satellites in VLEO face less communication opportunities due to the decreasing orbital altitude and shorter orbital periods. In mission-critical operations, long gaps between passes can result in delayed responses to emergencies, which is particularly important when losing altitude. Therefore, reducing these intervals is crucial for maintaining reliable communication links. To address this, the thesis investigates the optimal number and placement of additional ground stations to supplement the IRS ground station at the University of Stuttgart for various orbital configurations.



Your tasks

- Familiarization with VLEO satellite operations and the respective challenges
- Definition of communication needs for different mission phases
- Investigation of optimal ground station placement for VLEO missions
- Comparative assessment of ground station types (university vs. commercial networks)
- Operational analysis to determine necessary and optimal ground station configurations
- Documentation



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